Vishal Nagar

सुविचार इस शब्द में ही विचार आता है विचारों की इस बदलती श्रृंखला में ओर बदलते दौर में हमे सुविचार के माध्यम से कुछ कर दिखाने की प्रेरणा मिलती है हमारे लिए प्रेरणादायक होंगे.. सुविचार – Suvichar पढ़ने के बाद हमारे मन को एक नयी उर्जा मिलती है, जो हमें हमारे सभी काम सकारात्मक उर्जा के साथ करने के लिए प्रेरित करती है यदि आपको मेरी पोस्ट अछि लगती है तो फॉलो करें ।

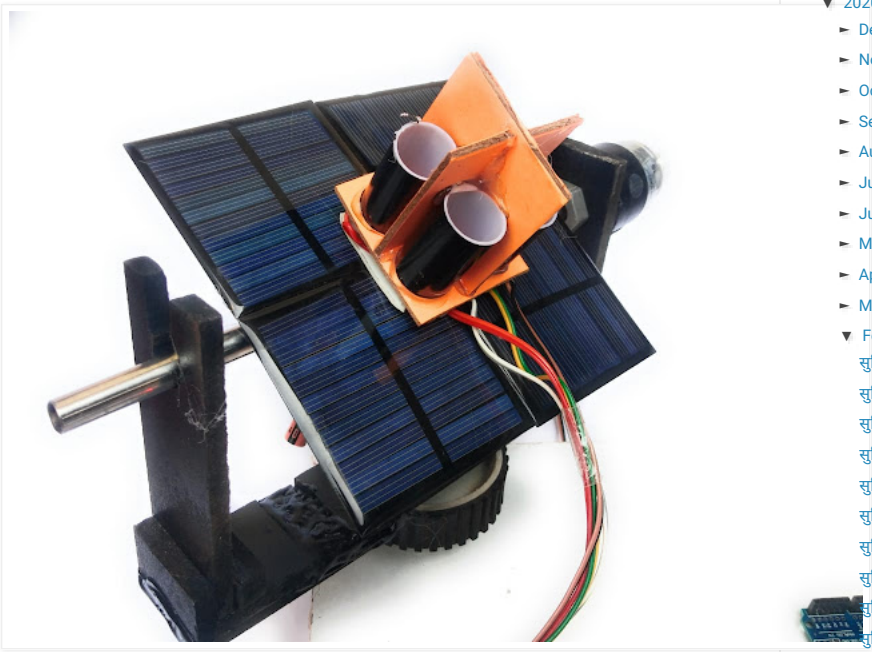
Thursday, 13 February 2020

DUAL AXIS SOLAR TRACKER SYSTEM

DUAL AXIS SOLAR TRACKER

ABSTRACT

A solar tracking system using Arduino is designed and built. This system collects free energy from the sun and stores it in the battery and then converts this energy to the respective alternating current. Its makes the energy usable in normal homes as an independent power source. This system is designed to react to its environment in the shortest amount of time. Any errors at software and hardware will be controlled or eliminated. Our system is tested for its real-time responsiveness, reliability, stability and safety. Our system is designed to be resistant to weather, temperature and some minor mechanical stresses.



As the energy demand and the environmental problems increase, the natural energy sources have become very important as an alternative to the conventional energy sources. The renewable energy sector is fast gaining ground as a new growth area for numerous countries with the vast potential it presents environmentally and economically. Solar energy plays an important role as a primary source of energy, especially for rural area. This project aims at the development of process to track the sun and attain maximum efficiency using Arduino and LDR Sensor for realtime monitoring. The project is divided into two stages, which are hardware and software development. In hardware development, two light dependent resistor (LDR) has been used for capturing

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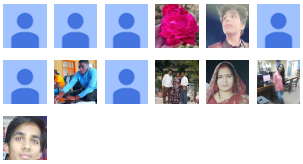

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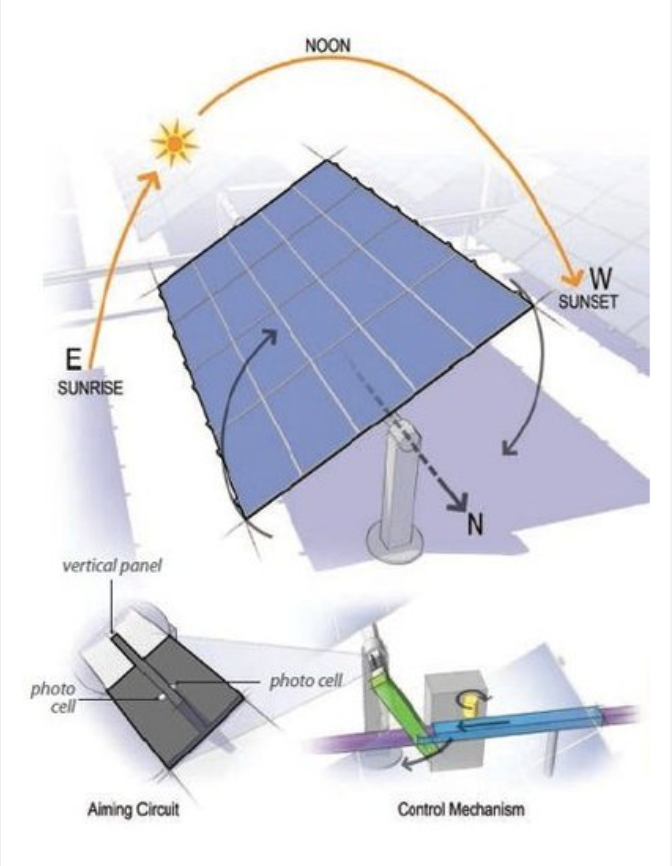
maximum light source. Servo motor has been used to move the solar panel at maximum light source location sensing by LDR. The performance of the system has been tested and compared with static solar panel. This project describes the design of a low cost, solar tracking system. In this project a dual axis solar tracking system has been developed by which more energy from the sun can be harnessed. In this project, an , Aurdino , has been used as the main controlling unit. To detect the position of the sun on the sky, two LDRs have been used and to rotate the orientation of the Solar PV panel a servo motor has been used. The sensors and servo motor have properly been interfaced .



The servo motor has been mechanically coupled with the PV panel. The whole system has been assembled together and its performance has been tested. This tracker changes the direction of the solar panel based on the direction of the sun facing to the panel successfully. dual axis solar tracker tracks the sun on daily basis and makes the solar panel more efficient.

Solar energy is rapidly advancing as an important means of renewable energy resource. It is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. Trackers direct solar panels or modules toward the sun. These devices change their orientation throughout the day to follow the sun's path to maximize energy capture. The use of solar trackers can increase electricity production by around a third, and some claim by as much as 40% in some regions, compared with modules at a fixed angle. In any solar application, the conversion efficiency is improved when the modules are continually adjusted to the optimum angle as the sun traverses the sky. This paper presents the designing of a solar tracking system which is based on Arduino UNO and which provides movement of solar panel in the direction of maximum sun light incident. As a result of which we get more efficient system which is compact, low cost as well as easy to use.

INTRODUCTION

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► January (36)

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► 2018 (130)
► 2017 (86)

- Home
- solar
- IR Proximity Sensor Library for Proteus
- arduino control Ac supply via using fan and light.
- How to Build an Arduino Library in hindi

Labels

- #
- # राम मंदिर
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- #370
- #AarogyaSetu
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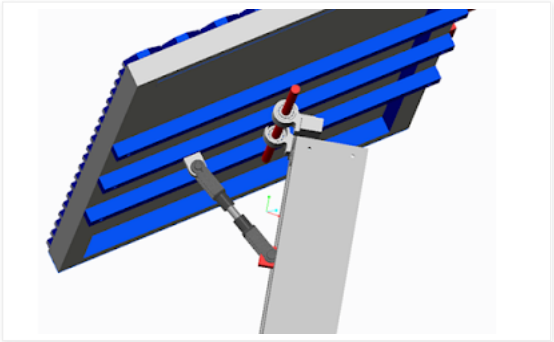
In this project a dual axis solar tracking system has been developed by which more energy from the sun can be harnessed. In this project, an Arduino Uno, which is an Atmel microcontroller-based board, has been used as the main controlling unit. To detect the position of the sun on the sky, two LDRs have been used and to rotate the orientation of the Solar PV panel a servo motor has been used. The sensors and servo motor have properly been interfaced with the Arduino board. The servo motor has been mechanically coupled with the PV panel. The driving program has been written using the Arduino IDE. The whole system has been assembled together and its performance has been tested. This tracker changes the direction of the solar panel based on the direction of the sun facing to the panel successfully. Single axis solar tracker tracks the sun on daily basis and makes the solar panel more efficient.

Solar energy is an unlimited source of energy which if harnessed properly will get the mankind devoid of using the conventional sources of energy he has been long using. This project has been designed keeping this in view to make the harnessing of solar energy more efficient. The conversion of solar light into electrical energy represents one of the most promising and challenging energetic technologies, in continuous development, being clean, silent and reliable, with very low maintenance costs and minimal ecological impact. A photovoltaic panel is a device used to capture the suns radiation. These panels consist of an array of solar cells. The solar cells are made up of silicon (sand). They are then connected to complete a photovoltaic (solar) panel. When the sun rays are incident on the solar cells, due to the photovoltaic effect, light energy from the sun is used to convert it to electrical energy. We know that most of the energy gets absorbed, when the panels surface is perpendicular to the sun. Stationary mounted PV (photo voltaic) panels are only perpendicular to sun once a day but the challenge for is to get maximum energy from the source, so for it we use trackers on which the whole system is mounted. In tracking system, solar panels move according to the movement of sun throughout the day**.**

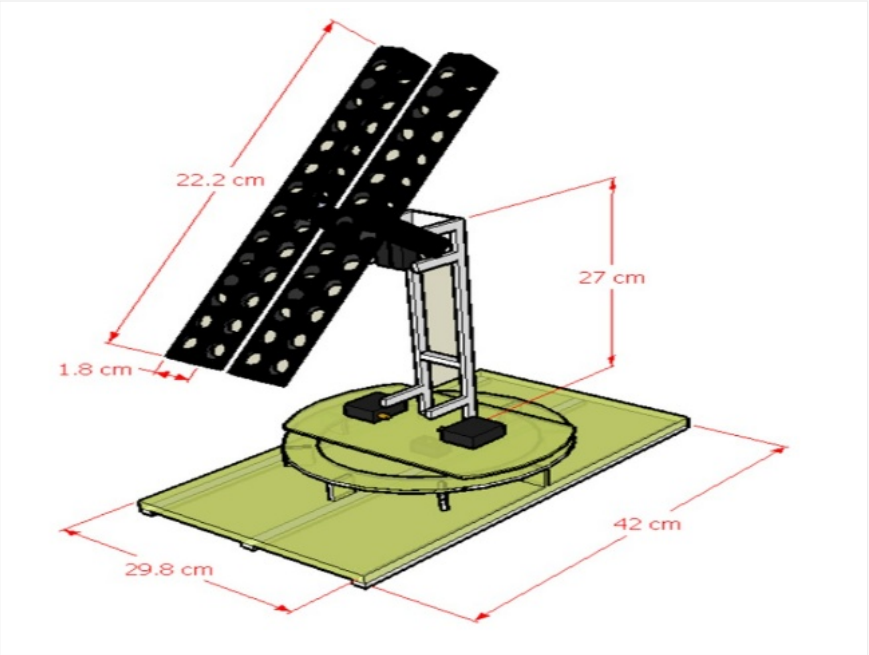
Tracker systems follow the sun throughout the day to maximize energy output. The Solar Tracker is a proven single-axis tracking technology that has been custom designed to integrate with solar modules and reduce system costs. The Solar Tracker generates up to 25% more energy than fixed mounting systems and provides a bankable energy production profile preferred by utilities.



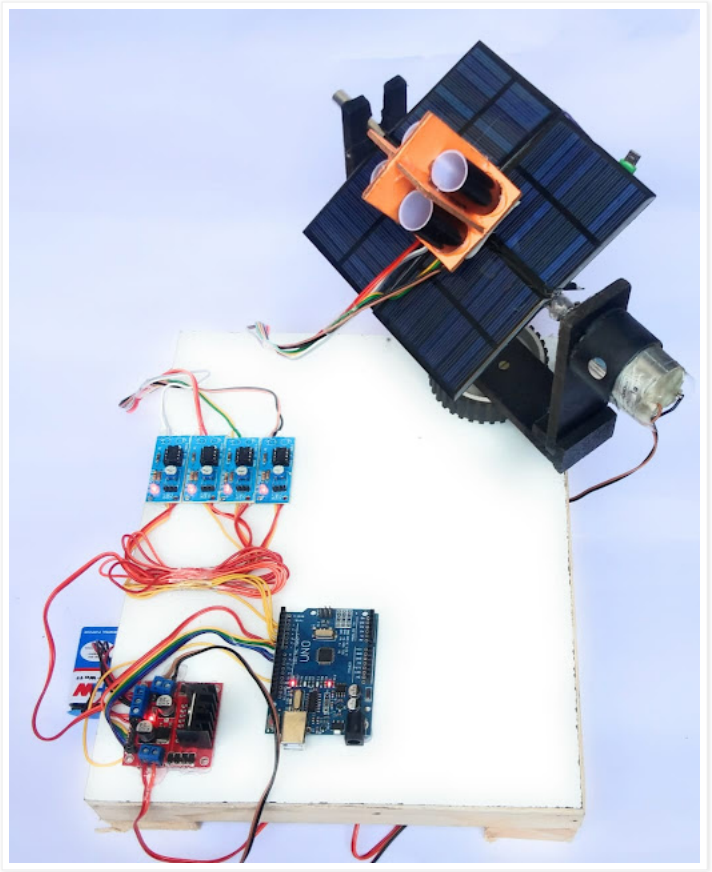
DUAL- AXIS TRACKING SYSTEM

To track the sun in two directions that is elevation and azimuth, a dual-axis tracking prototype is developed to capture the maximum sun rays by tracking the movement of the sun in four different directions. One axis is azimuth which allows the solar panel to move left and right. Our tracker is a **dual axis tracker**, meaning it tracks in both X and Y. To put it into even more simple terms, it goes left, right, up, and down. This means once you have your tracker set up you will never need to change or adjust anything, since anywhere the sun moves your tracker will follow. This also impresses people at parties because

you can have it track a flashlight around. This method gives the best results for power generation.



A Solar tracker is an automated solar panel which actually follows the sun to get maximum power. The primary benefit of a tracking system is to collect solar energy for the longest period of the day, and with the most accurate alignment as the Sun's position shifts with the seasons . Dual Axis Tracker have two different degrees through which they use as axis of rotation. The dual axis are usually at a normal of each rotate both east to west and north to south. Solar tracking is the most appropriate technology to enhance the electricity production of a PV system. To achieve a high degree of tracking accuracy, several approaches have been widely investigated. Generally, they can be classified as either open-loop tracking types based on solar movement mathematical models or closed-loop tracking types using sensor-based feedback controllers . In the open-loop tracking approach, a tracking formula or control algorithm is used. the azimuth and the elevation angles of the Sun were determined by solar movement models or algorithms at the given date, time and geographical information. The control algorithms were executed in a microprocessor controller . In the closed-loop tracking approach, various active sensor devices, such as charge couple devices (CCDs) or light dependent resistors (LDRs) were utilized to sense the Sun's positio a feedback error signal has the generated to the control system to continuously receive the maximum solar radiation on the PV panel. This paper proposes an empirical research approach on this issue. Solar tracking approaches can be implemented by using single-axis schemes , and dual-axis structures for higher accuracy systems. In general, the single-axis tracker with one degree of freedom follows the Sun follows the movement from the east to west during a day while a dual-axis tracker also follows the elevation angle of the Sun. In recent years, there has been a growing volume of research concerned with dual-axis solar tracking systems. However, in the existing research, most of them used two stepper motors or two DC motors to perform dual-axis solar tracking. With two tracking motors designs, two motors were mounted on perpendicular axes, and even aligned them in certain directions. In some cases, both motors could not move at the same time . Furthermore, such systems always involve complex tracking strategies using microprocessor chips as a control platform. In this work, employing a dual-axis with only single tracking motor, an attempt has been made to develop and implement a simple and efficient control scheme.



The two axes of the Sun tracker were allowed to move simultaneously within their respective ranges. Utilizing conventional electronic circuits, no programming or computer interface was needed. Moreover, the proposed system used a stand-alone PV inverter to drive motor and provide power supply. The system was self-contained and autonomous. Experiment results have demonstrated the feasibility of the tracking PV system and verified the advantages of the proposed control implementation.

There are three methods of tracking:

1. **Active**
2. **Passive**
3. **Chronological and Manual tracking systems.**

1.Active tracking system:- The position of the sun is determined by the sensors. These sensors will trigger the motor to move the mounting system so that the panels will always face the sun rays perpendicular to it throughout the day. But in this system it is very difficult for sensors to determine the position of sun in cloudy days. So it is not a very accurate.

2.Passive tracking systems:- The position of the sun by moving the panels in response to an imbalance pressure between the two points at both ends of the trackers. The imbalance pressure caused by solar heat creates a gas pressure on a low boiling point compressed gas fluid that is driven to one side or the other accordingly, which then moves the system. This method is also not accurate as the shade /reflectors that are used to reflect early morning sunlight to “wake up” the panel and tilt it towards the sun can take nearly an hour to do so.

3.Chronological system:- A chronological tracker is a timer-based tracking system whereby the structure is moved at a fixed rate throughout the day. The theory behind this is that the sun moves across the sky at a fixed rate. Thus the

motor or actuator is programmed to continuously rotate at a „slow average rate of one revolution per day (15 degrees per hour).

This method of sun-tracking is very accurate. However, the continuous rotation of the motor or actuator means more power consumption and tracking the sun. In manual tracking system, drives are replaced by operators who adjust the trackers. This has the benefits of robustness having staff available for maintenance and creating employment for the population in the vicinity of the site.

COMPONENTS OF SOLAR TRACKER

1. 10 rpm gear motor
2. 4 volt small solor plate
3. L293D motor driver
4. IR sensor according to video
5. 4 LDR sensor
6. Arduino uno
7. Wooden base
8. 2 battery cap
9. 9 volt battery

10 RPM GEAR MOTOR:- A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. Gear motors can be found in many different applications, and are probably used in many devices in your home.

Gear motors are commonly used in devices such as can openers, garage door openers, washing machine time control knobs, and even electric alarm clocks. Common commercial applications of a gear motor include hospital beds, commercial jacks, and cranes. Regardless of what type of gear motor you're dealing with, they all work in the same manner. Gear motors are commonly used in commercial applications where a piece of equipment needs to be able to exert a high amount of force in order to move a very heavy object.

A gear motor or stepping motor is a dc brushless electric motor that divides a full rotation into a display device is an output device for presentation of information in visual or tactile form. When the input information is supplied has an electrical signal, the display is called an electronic display number of equal step. The motor's position can then be commanded to move and hold at one of these steps without any position sensor for feedback as long as the motor is carefully sized to the application in respect to torque and speed.

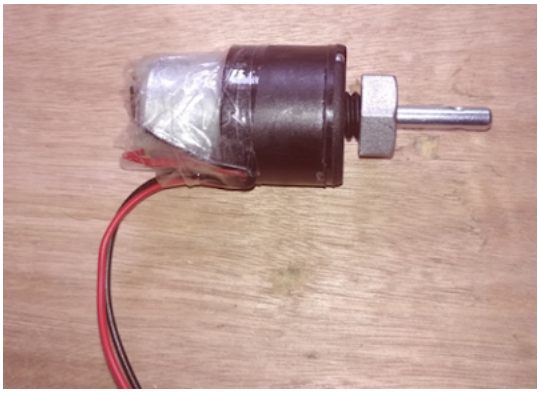


Fig :Dc gear motor Diagram

4 VOLT SMALL SOLOR PLATE:- A photovoltaic module is a packaged, connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic

modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 W module will have twice the area of a 16% efficient 230 W module. There are a few commercially available solar modules that exceed efficiency of 22% and reportedly also exceeding 24%.

A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism. The most common application of solar panels is solar water heating systems.

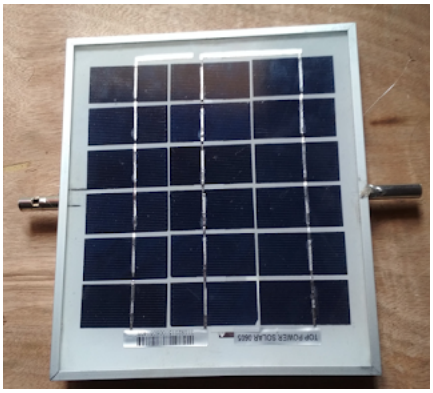


Fig : Solar panel Diagram

L293D MOTOR DRIVER:- :- L293D is a Motor driver IC used to control motors with a microcontroller. This motor shield consists of three IC's. We can control 4 motors with the shield so there are two L293d Ic's used. The motor shield is used for (Arduino Uno) board. This shield can control servo's, Dc motors and stepper motors.

The two chips of L293D can control four motors with 0.6 A per bridge. The best thing about the shield is we don't need to write the whole function for driving a motor there is a special library for this module. we just recall some commands to run the motor.

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*). The l293d can drive small and quiet big motors as well, check the Voltage Specification In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

TIP: you can simply connect the pin16 VCC (5v) to pin 1 and pin 9 to make them high.

IR (INFRA RED) sensor :-

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

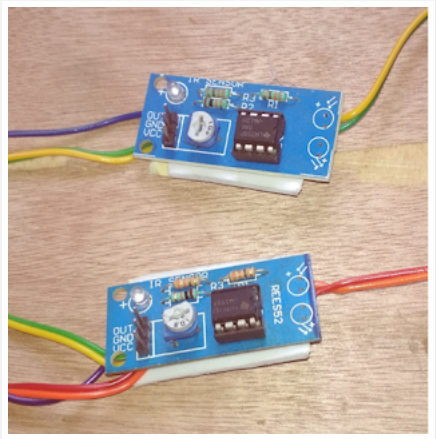


Fig: IR Sensor

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses.

-

IR SENSOR APPLICATIONS

IR sensors are used in various Sensor based projects and also in various electronic devices.

Radiation Thermometers

IR sensors are used in radiation thermometers to measure the temperature depend upon the temperature and the material of the object and these thermometers have some of the following features

- Measurement without direct contact with the object
- Faster response
- Easy pattern measurements

Flame Monitors

These types of devices are used for detecting the light emitted from the flames and to monitor how the flames are burning. The Light emitted from flames extend from UV to IR region types. PbS, PbSe, Two-color detector, pyro electric detector are some of the commonly employed detector used in flame monitors.

Moisture Analyzers

Moisture analyzers use wavelengths which are absorbed by the moisture in the IR region. Objects are irradiated with light having these wavelengths(1.1 μm, 1.4 μm, 1.9 μm, and 2.7μm) and also with reference wavelengths. The Lights reflected from the objects depend upon the moisture content and is detected by analyzer to measure moisture (ratio of reflected light at these wavelengths to the reflected light at reference wavelength). In GaAs PIN photodiodes, Pbs photoconductive detectors are employed in moisture analyzer circuits.

Gas Analyzers

IR sensors are used in gas analyzers which use absorption characteristics of gases in the IR region. Two types of methods are used to measure the density of gas such as dispersive and non dispersive.

Dispersive: An Emitted light is spectroscopically divided and their absorption characteristics are used to analyze the gas ingredients and the sample quantity.

Non dispersive: It is most commonly used method and it uses absorption characteristics without dividing the emitted light. Non dispersive types use discrete optical band pass filters, similar to sunglasses that are used for eye protection to filter out unwanted UV radiation.
This type of configuration is commonly referred to as non dispersive infrared (NDIR) technology. This type of analyzer is used for carbonated drinks, whereas non dispersive analyzer is used in most of the commercial IR instruments, for an automobile exhaust gas fuel leakages.

IR Imaging Devices

IR image device is one of the major applications of IR waves, primarily by virtue of its property that is not visible. It is used for thermal imagers, night vision devices, etc.

For examples Water, rocks, soil, vegetation, an atmosphere, and human tissue all features emit IR radiation. The Thermal infrared detectors measure these radiations in IR range and map the spatial temperature distributions of the object/area on an image. Thermal imagers usually composed of a Sb (indium antimonite), Gd Hg (mercury-doped germanium), Hg Cd Te (mercury-cadmium-telluride) sensors.

An electronic detector is cooled to low temperatures using liquid helium or liquid nitrogen's. Then the Cooling the detectors ensures that the radiant energy (photons) recorded by the detectors comes from the terrain and not from the ambient temperature of objects within the scanner itself an IR imaging electronic devices.

LDR SENSOR:- - A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights. On the top and bottom are metal films which are connected to the terminal leads. It is designed in such a way as to provide maximum possible contact area with the two metal

films. The structure is housed in a clear plastic or resin case, to provide free access to external light. As explained above, the main component for the construction of LDR is cadmium sulphide (CdS), which is used as the photoconductor and contains no or very few electrons when not illuminated. In the absence of light it is designed to have a high resistance in the range of mega ohms. As soon as light falls on the sensor, the electrons are liberated and the conductivity of the material increases. When the light intensity exceeds a certain frequency, the photons absorbed by the semiconductor give band electrons the energy required to jump into the conduction band. This causes the free electrons or holes to conduct electricity and thus dropping the resistance dramatically (< 1 Kilo ohm).

A photo resistor (or light-dependent resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light-activated and dark-activated switching circuits.

A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several mega ohms (MΩ), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photo resistor can substantially differ among dissimilar devices. Moreover, unique photo resistors may react substantially differently to photons within certain wavelength bands. The solar tracker system will obtain its data from two CDS (Cadmium Sulfide) photocells, which are type of LDR. The material used in CDS photocell is of high resistance semiconductor. Therefore, once light falls on its surface, photons absorbed by the semiconductor will give bound electrons enough energy to jump in to the conduction band. As the result free electrons conduct electricity and thus lower the resistance. In case of high intensity, photocell will produce lowest resistance, the opposite will occur in case of complete darkness.

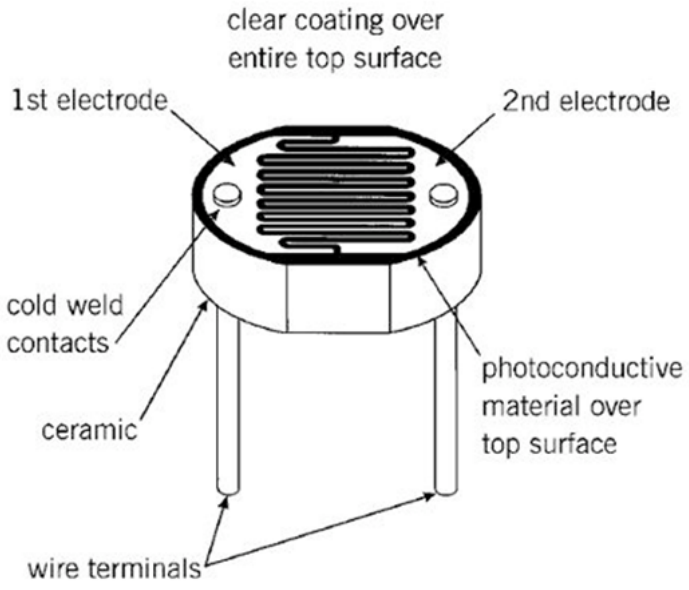


Figure 3
Typical Construction of a Plastic Coated Photocell

ARDUINO UNO:- The Arduino Uno is a microcontroller board based on the ATmega328.It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (*shields*) and other circuits.

The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains the Arduino project provides an integrated development environment (IDE) based on the Processing language project. Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed *shields*. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Arduino UNO is the optiboot bootloader Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial arduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

· Fig :Arduino circuit Diagram

BATTERY CAP: A battery assembled cap, a cylindrical battery with the cap and a method for making the same. The vent cap is attached to the battery cover by a hinge connection which allows for play between the vent cap and the battery cover and which allows for rotation of the vent cap.
A battery holder is one or more compartments or chambers for holding a battery.

For dry cells, the holder must also make electrical contact with the battery terminals. For wet cells, cables are often connected to the battery terminals, as is found in automobiles or emergency lighting equipment The purpose of the vent caps is to allow for the escape of gases formed when the battery is charging. In addition, the vent caps allow water and acid levels of the battery to be checked during maintenance. Lead-acid batteries can produce explosive mixtures of hydrogen and oxygen gases when they are being charged.

Battery can play an important role in achieving the target of universal access to clean, reliable and affordable electricity services. Battery is an energy storage device consisting of two or more electrochemical cells that convert stored chemical energy into electrical energy and used as a source of power

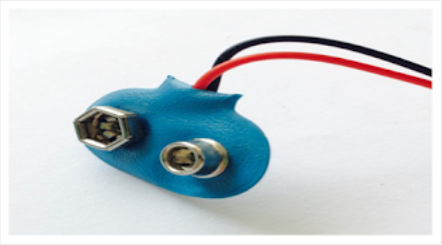


Fig:- Basttery cap

VOLT BATTERY:- :- A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another. As a result, power supplies are sometimes referred to as electric power converters. A battery is an electrochemical device that produces a voltage potential when placing metals of different affinities into an acid solution (electrolyte). The open circuit voltage (OCV) that develops as part of an electrochemical reaction varies with the metals and electrolyte used

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars.

When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.

Fig :Battery

OPERATION

1. LDRs are used as the main light sensors. Two servo motors are fixed to the structure that holds the solar panel. The program for Arduino is uploaded to the microcontroller. The working of the project is as follows.

2. LDRs sense the amount of sunlight falling on them. Four LDRs are divided into top, bottom, left and right.

3. For east – west tracking, the analog values from two top LDRs and two bottom LDRs are compared and if the top set of LDRs receive more light, the

vertical servo will move in that direction.
4. If the bottom LDRs receive more light, the servo moves in that direction.
5. For angular deflection of the solar panel, the analog values from two left LDRs and two right LDRs are compared. If the left set of LDRs receive more light than the right set, the horizontal servo will move in that direction.

6. If the right set of LDRs receive more light, the servo moves in that direction.

WORKING:

The principle of the solar tracking system is done by Light Dependant Resistor (LDR). Four LDR's are connected to Arduino analog pin AO to A4 that acts as the input for the system. The built-in Analog-to-Digital Converter will convert the analog value of LDR and convert it into digital. The inputs are from analog value of LDR, Arduino as the controller and the DC motor will be the output. LDR1 and LDR2, LDR3 and LDR4 are taken as pair .If one of the LDR in a pair gets more light intensity than the other, a difference will occur on node voltages sent to the respective Arduino channel to take necessary action. The DC motor will move the solar panel to the position of the high intensity LDR that was in the programming.

PROGRAMMING OF AURDUINO DUAL- AXIS TRACKING SYSTEM:-

```
void setup() {
  // initialize digital pin 13 as an output.

pinMode(2, INPUT);
pinMode(3, INPUT);
pinMode(4, INPUT);

pinMode(5, INPUT);
pinMode(6,OUTPUT );
pinMode(7,OUTPUT );
pinMode(8,OUTPUT );
pinMode(9,OUTPUT );
}

// the loop function runs over and over again forever
void loop()
{
if( digitalRead(2)&&digitalRead(3)&&digitalRead(4)&&digitalRead(5)==HIGH)
{
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
}
else if( digitalRead(2)&&digitalRead(4)==HIGH)
{

digitalWrite(6,HIGH);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,LOW);
}
else if( digitalRead(3)&&digitalRead(5)==HIGH)
{
digitalWrite(6,LOW);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,HIGH);
}
else if( digitalRead(2)&&digitalRead(5)==HIGH)
{
digitalWrite(6,HIGH);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,HIGH);
}
else if( digitalRead(3)&&digitalRead(4)==HIGH)
{
digitalWrite(6,LOW);
```

```
digitalWrite(7,HIGH);

digitalWrite(8,HIGH);
digitalWrite(9,LOW);
}
else  if( digitalRead(2)==HIGH)
{
digitalWrite(6,HIGH);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
}
else if( digitalRead(3)==HIGH)
{
digitalWrite(6,LOW);
digitalWrite(7,HIGH);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
}
else if( digitalRead(4)==HIGH)
{
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,HIGH);
digitalWrite(9,LOW);
}

else if( digitalRead(5)==HIGH)
{
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,HIGH);
}
else
{
digitalWrite(6,LOW);
digitalWrite(7,LOW);
digitalWrite(8,LOW);
digitalWrite(9,LOW);
}
}
```

ADVANTAGE:-

- Trackers generate more electricity than their stationary counterparts due to increased direct exposure to solar rays.
- Solar trackers generate more electricity in roughly the same amount of space needed for fixed-tilt systems, making them ideal for optimizing land usage.
- Advancement in technology and reliability in electronics and mechanics have drastically reduced long term maintenance concerns for tracking systems

- Trackers generate more electricity than their stationary counterparts due to increased direct exposure to solar rays. This increase can be as much as 10 to 25% depending on the geographic location of the tracking system.
- There are many different kinds of solar trackers, such as single-axis and dual axis trackers, all of which can be the perfect fit for a unique jobsite. Installation size, local weather, degree of latitude and electrical requirements are all important considerations that can influence the type of solar tracker best suited for a specific solar installation.
- Solar trackers generate more electricity in roughly the same amount of space needed for fixed-tilt systems, making them ideal for optimizing land usage.
- In certain states, some utilities offer Time of Use (TOU) rate plans for solar power, which means the utility will purchase the power generated during the peak time of the day at a higher rate. In this case, it is beneficial to generate a greater amount of electricity during these peak times of the day. Using a tracking system helps maximize the energy

gains during these peak time periods.

- Advancements in technology and reliability in electronics and mechanics have drastically reduced long-term maintenance concerns for tracking systems.

APPLICATION

Solar Photovoltaic plants require continuous orientation towards sun for consistent efficiency output. This product will prove a great boon for them.

Solar water heating applications can also implement the same technique to heat water throughout the day.

Concentrated applications like concentrated photovoltaic panels require a high degree of accuracy to ensure the sunlight is directed precisely at the focal point of the reflector or lens.

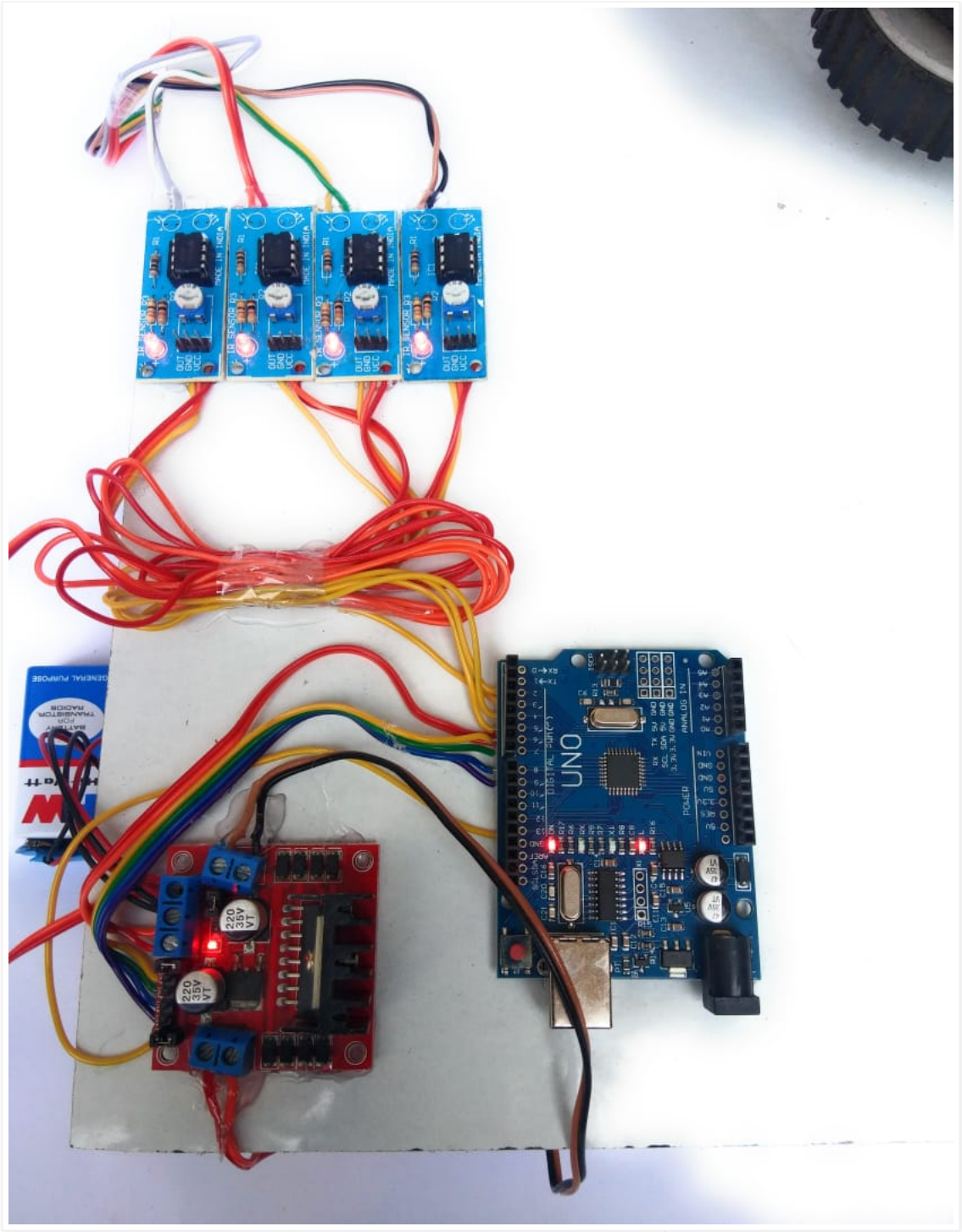
Non concentrating applications do not require tracking but using a tracker can improve the total power produced by the system. Photovoltaic systems using high efficiency panels with trackers can be very effective

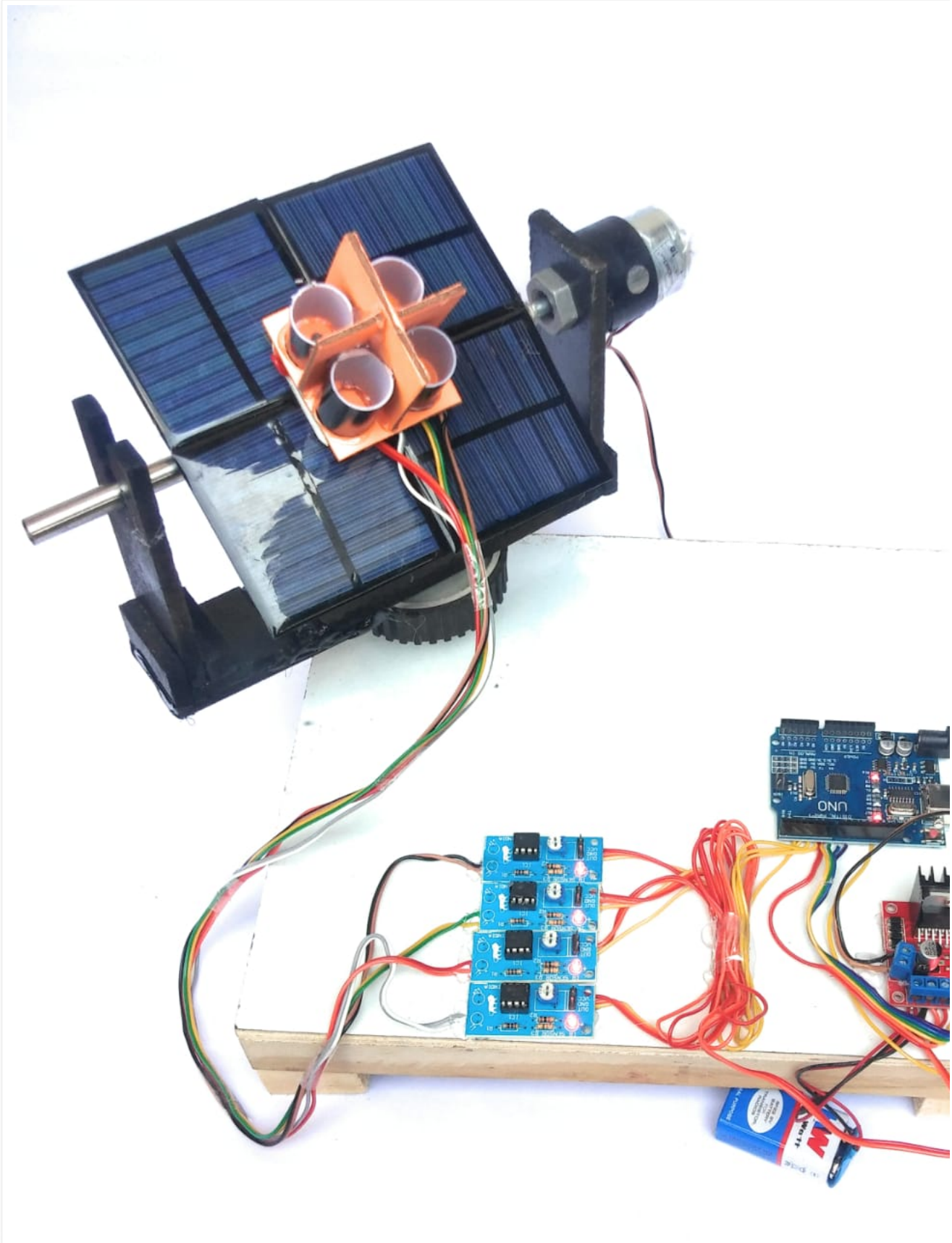
CONCLUSION:

The proposed dual axis solar tracker automatically tracks position of sun and maximize the solar power with help of arduino. As compared to single axis, dual-axis system provide high abundant electrical energy output when compared to the fıxed mount system. The Dual axis tracker is having more efficiency. The main aim of this work is to develop two axis solar tracker system that uses four sensors(ldr s) to predict the sun position. Secondly, program is dumped on to Arduino (ATmega 328 p) so that rotation of servo motor can be controlled by employing the microcontroller. The programming part consists of 5 cases which has been stated and analyzed. Thirdly, to investigate the voltage differences from the sensor (light depending resistor LDR) based on intensity of light received by the sensor. The output has plotted into a graph and compared with static system. And proposed system is eco friendly, and widely used.

As dual-axis tracking generates 40% more power from each panel, you can achieve the same power output with fewer panels, frames and so on, which reduces a project's upfront costs and offsets to a great extent the additional cost for tracking hardware. On the other hand, you can use the same number of panels as originally planned and generate 40% more power and higher revenues. This reduces the project's payback time and also increases the overall return on investment (ROI), depending on the financial specifics of the project.

Solar radiation Tracker has played a vital role in increasing the efficiency of solar panels in recent years, thus proving to be a better technological achievement. The vital importance of a dual axis solar tracker lies in its better efficiency and sustainability to give a better output compared to a fived solar panel or a single axis solar tracker. The tracking system is designed such that it can trap the solar energy in all possible directions. Generally, in a single axis tracker that moves only along a single axis it is not possible to track the maximum solar energy. In case of dual axis trackers, if the solar rays are perpendicular to panel throughout the year. Hence, maximum possible energy is trapped throughout the day as well as throughout the year. Thus, the output increases indicating that the efficiency more than a fixed solar panel (about 30 -40% more) or a single axis solar tracker (about 6-7% more).


OUT
GND
VCC
UNO
220
35V
VT



दुनिया का सबसे सस्ता जहाज